

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Reissue Patent Application:

Applicant : Gurtej S. Sandhu
Assignee: : Micron Technology, Inc.
Filed : December 28, 2001
For : METHOD AND APPARATUS FOR ENDPOINTING MECHANICAL AND
CHEMICAL-MECHANICAL POLISHING OF SUBSTRATES
Docket No. : 500042.02

Corresponding Issued U.S. Patent:

Patent No. : 6,007,408
Issued : December 28, 1999
Application No. : 08/917,665
Filing Date : August 21, 1997
Examiner : George Nguyen
Art Unit : 3723

BOX REISSUE
Commissioner for Patents
Washington, DC 20231

PRELIMINARY AMENDMENT

Sir:

Please accept the request for a reissue of U.S. Patent No. 6,007,408, filed herewith. Prior to conducting the examination of the reissue claims, please amend the reissue application as follows:

Please add the following new claims 14-49:

-- 14. The method of claim 1, further comprising sensing the pH of the byproducts.

15. The method of claim 1, further comprising sensing the conductivity of the byproducts.

16. The method of claim 1, further comprising determining the chemical composition of the byproducts.

17. The method of claim 1 wherein the temperature of the byproducts has a first value when the cover layer of the substrate engages a polishing medium and a second value when a portion of an underlying layer of the substrate under the cover layer engages the polishing medium, and wherein the method further comprising adding a reactive agent to a planarizing liquid and depositing the planarizing liquid onto a planarizing surface of a polishing pad, the reactive agent selectively reacting with the material of the underlying layer to produce a greater difference between the first and second values with the reactive agent than without the reactive agent.

18. The method of claim 1 wherein the act of sensing the temperature of the byproducts comprises holding the byproducts in a separate cell, adding a reactive agent to the byproducts that detects the presence of material from the underlying layer in the byproducts, and sensing the temperature of the byproducts.

19. The method of claim 5, further comprising sensing the pH of the byproducts.

20. The method of claim 5, further comprising sensing the conductivity of the byproducts.

21. The method of claim 5, further comprising determining the chemical composition of the byproducts.

22. The method of claim 5 wherein the temperature of the byproducts has a first value when the cover layer of the substrate engages a polishing medium and a second value when a portion of an underlying layer of the substrate under the cover layer engages the polishing medium, and wherein the method further comprising adding a reactive agent to a planarizing liquid and depositing the planarizing liquid onto a planarizing surface of a polishing pad, the

reactive agent selectively reacting with the material of the underlying layer to produce a greater difference between the first and second values with the reactive agent than without the reactive agent.

23. The method of claim 5 wherein the act of sensing the temperature of the byproducts comprises holding the byproducts in a separate cell, adding a reactive agent to the byproducts that detects the presence of material from the underlying layer in the byproducts, and sensing the temperature of the byproducts.

24. The method of claim 7, further comprising sensing the pH of the byproducts.

25. The method of claim 7, further comprising sensing the conductivity of the byproducts.

26. The method of claim 7, further comprising determining the chemical composition of the byproducts.

27. The method of claim 7 wherein the temperature of the byproducts has a first value when the cover layer of the substrate engages a polishing medium and a second value when a portion of an underlying layer of the substrate under the cover layer engages the polishing medium, and wherein the method further comprising adding a reactive agent to a planarizing liquid and depositing the planarizing liquid onto a planarizing surface of a polishing pad, the reactive agent selectively reacting with the material of the underlying layer to produce a greater difference between the first and second values with the reactive agent than without the reactive agent.

28. The method of claim 7 wherein the act of sensing the temperature of the byproducts comprises holding the byproducts in a separate cell, adding a reactive agent to the byproducts that detects the presence of material from the underlying layer in the byproducts, and sensing the temperature of the byproducts.

29. The method of claim 8 further comprising adding a reactive agent to a planarizing solution and depositing the planarizing solution onto the planarizing surface of the polishing pad, the reactive agent producing a first difference between the first and second temperatures that is greater than a second difference between the first and second temperatures without the reactive agent in the planarizing solution.

30. The method of claim 29 wherein the planarizing solution comprises an H₂O₂ based planarizing liquid and the reactive agent is one of the compounds selected from the group consisting of HCl, NH₄OH and KOH.

31. The method of claim 8, further comprising:
holding byproducts produced by polishing the substrate in a separate cell; and
adding a reactive agent to the byproducts in the cell, the reactive agent detecting the presence of material from the underlying layer in the byproducts.

32. The method of claim 10, further comprising adding a reactive agent to a planarizing solution and depositing the planarizing solution onto the planarizing surface of the polishing pad, the reactive agent producing a first difference between the first and second heat ranges that is greater than a second difference between the first and second heat ranges without the reactive agent in the planarizing solution.

33. A method for determining when the polishing of a substrate has reached an endpoint, the substrate having a cover layer and an underlying layer under the cover layer, the method comprising monitoring a characteristic of a polishing component indicative of material being removed from a planarized surface of the substrate, wherein the component comprises byproducts produced by polishing the substrate and the characteristic is a temperature of the byproducts, and wherein the monitoring step comprises sensing the temperature of the byproducts.

34. The method of claim 33 wherein the sensing step comprises measuring a temperature of a planarizing liquid flowing off of a polishing pad.

35. The method of claim 33, further comprising sensing the pH of the byproducts.

36. The method of claim 33, further comprising sensing the conductivity of the byproducts.

37. The method of claim 33, further comprising determining the chemical composition of the byproducts.

38. The method of claim 33 wherein the temperature of the byproducts has a first value when the cover layer of the substrate engages a polishing medium and a second value when a portion of an underlying layer of the substrate under the cover layer engages the polishing medium, and wherein the method further comprising adding a reactive agent to a planarizing liquid and depositing the planarizing liquid onto a planarizing surface of a polishing pad, the reactive agent selectively reacting with the material of the underlying layer to produce a greater difference between the first and second values with the reactive agent than without the reactive agent.

39. The method of claim 33 wherein the act of sensing the temperature of the byproducts comprises holding the byproducts in a separate cell, adding a reactive agent to the byproducts that detects the presence of material from the underlying layer in the byproducts, and sensing the temperature of the byproducts.

40. A method for determining when the polishing of a substrate has reached an endpoint, the method comprising detecting a change in heat at a front side of the substrate, the heat at the front side of the substrate being different when a cover layer of the substrate engages a polishing medium than when at least a portion of an underlying layer of the substrate under the

cover layer engages the polishing medium, wherein detecting a change in heat at the front side of the substrate comprises sensing a temperature of byproducts produced by polishing the substrate.

41. The method of claim 40 wherein the temperature sensing act comprises measuring a temperature of a planarizing solution flowing off of the polishing pad.

42. The method of claim 40 wherein the temperature of the byproducts has a first value when the cover layer of the substrate engages a polishing medium and a second value when a portion of an underlying layer of the substrate under the cover layer engages the polishing medium, and wherein the method further comprising adding a reactive agent to a planarizing liquid and depositing the planarizing liquid onto a planarizing surface of a polishing pad, the reactive agent selectively reacting with the material of the underlying layer to produce a greater difference between the first and second values with the reactive agent than without the reactive agent.

43. The method of claim 40 wherein the act of sensing the temperature of the byproducts comprises holding the byproducts in a separate cell, adding a reactive agent to the byproducts that detects the presence of material from the underlying layer in the byproducts, and sensing the temperature of the byproducts.

44. A method for stopping polishing of a substrate at an endpoint, the substrate having a cover layer and an underlying layer under the cover layer, the method comprising:

monitoring a temperature of a polishing component that is in contact with byproducts produced by polishing the substrate, the temperature of the polishing component having a first value when the cover layer of the substrate engages a polishing medium and a second value when a portion of an underlying layer of the substrate under the cover layer engages the polishing medium;

adding a reactive agent to a planarizing liquid and depositing the planarizing liquid onto a planarizing surface of a polishing pad, the reactive agent selectively reacting with

the material of the underlying layer to produce a greater difference between the first and second values with the reactive agent than without the reactive agent; and

stopping removal of material from the substrate when the temperature of the polishing component is at a predetermined value that indicates the material being removed from the planarized surface is at the endpoint of the substrate.

45. The method of claim 44 wherein the act of monitoring a temperature of a polishing component that is in contact with byproducts produced by polishing the substrate comprises monitoring the temperature of the byproducts.

46. The method of claim 45 wherein the act of monitoring the temperature of the byproducts comprises holding the byproducts in a separate cell, adding a reactive agent to the byproducts that detects the presence of material from the underlying layer in the byproducts, and sensing the temperature of the byproducts.

47. The method of claim 44, further comprising sensing the pH of the byproducts.

48. The method of claim 44, further comprising sensing the conductivity of the byproducts.

49. The method of claim 44, further comprising determining the chemical composition of the byproducts. - -


REMARKS

Consideration of this reissue application in view of the above amendments and following remarks is respectfully requested. Applicant is requesting reissue on the basis that the '408 patent is, through error without any deceptive intention, deemed wholly or partially inoperative by reason of the patentee claiming less than he had a right to claim in the '408 patent. For example, claim 1 of the '408 patent is limited to a method for stopping polishing of a

[illegible]

Applicant believes claims 1-49 are in condition for allowance and respectfully requests such action.

Respectfully submitted,


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8